

Mouth Sticks to Full Control

Accessibility Concerns for Visually Rich Mobile Applications

Sean Petty
University of Michigan 3D Lab
sepetty@umich.edu

The logo for GDC 13 NEXT, featuring the text "GDC" in a large, bold, sans-serif font, with "13" inside a circle to the right of the "G", and "NEXT" in a smaller, bold, sans-serif font below it. The background is a vibrant blue and green abstract design with glowing lines and shapes, including a stylized eye and a keyboard key labeled "F2P".

GDC
13
NEXT

NOVEMBER 5-7, 2013
EXPO DATES: NOV 5-6
LOS ANGELES, CA

GDCNext.com



Agenda

1. The Landscape
2. Know Your Audience
3. Design Guidelines



The Landscape

Some Context ...

- Work done in collaboration with IGDA Accessibility SIG for Constance Steinkuehler, Former Senior Policy Analyst at the Office of Science and Technology Policy in the Executive Office of the U.S. President. (2012)
- Work is heavily inspired by W3C/WCAG
- 10+ years of application and web development experience.

Someone You Should Know...

IGDA (International Game Developers Association)

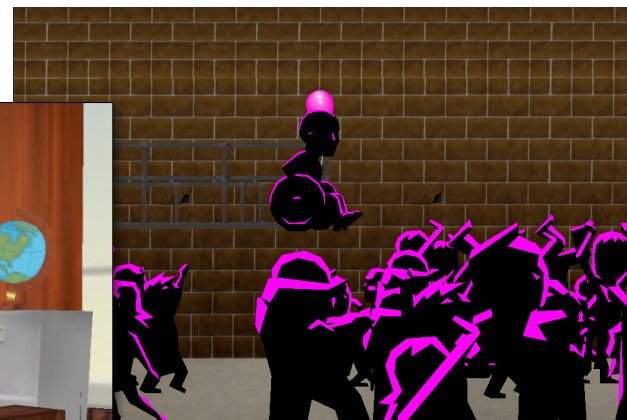
Game Accessibility Special Interest Group

<http://igda-gasig.org>

- Game Accessibility Top 10
- Methods for Providing Accessibility
- How Many Need It?
- Etc.

What Type of Applications Are We Focusing On...

Visually Dynamic and Rich User Experiences on Mobile Platforms.



What is Accessibility?

The ability to fully experience an application even when functioning under limiting conditions.



Possible Limiting Conditions

Vision

- Vision Loss (e.g. mild, moderate, severe, blindness)
- Color Blindness
- Visual Motor Impairment (e.g. visual tracking, diplopia)
- Visual Field Loss

Motor (e.g. arms, hands, trunk, legs)

- Motor control impairment (e.g. coordination, aiming, response speed)
- Muscle weakness
- Muscle Tone (e.g. rigidity, spasticity, hypo/hypertonicity, tremor)
- Balance (e.g. vestibular, visual, proprioceptive)
- Range of Motion limitation

Hearing

- Hearing Loss (e.g. mild, moderate, severe, deafness)

Vocal & Communication (i.e. speech)

- Speech disorder (e.g. articulation, fluency, voice)
- Language (e.g. form, content, function)
- Muteness

Cognitive

- Attention (e.g. divided attention)
- Memory (e.g. working memory, memory span, associative memory)
- Executive Function (e.g. planning, decision making, learning)
- Visual Perceptual (e.g. visual closure, visualization)

Some Numbers ...

Category	Number	%
No disability	190,288,000	78.7
Severe disability	35,683,000	14.8
Not severe disability	15,770,000	6.5
Total population	241,682,000	100.0

Type	Number	%
Visual – Severe	2,010,000	0.8
Visual – Not severe	6,607,000	2.8
Auditory – Severe	1,096,000	0.4
Auditory – Not severe	6,475,000	3.4
Mobility – Severe	14,698,000	7.1
Mobility – Not severe	10,441,000	5.0
Learning disability	3,451,000	1.7
Other mental disability (dementia, mental retardation, other unspecified)	6,657,000	3.2
Other disabilities (Speech)	2,270,000	1.1
Total	53,155,000	

Source: 2010 Census Data

Current State... (Games)

Vision – Even the simplest issues (such as font size and contrast) are rarely considered, resulting in significant issues for older players in particular.

Hearing – Subtitling/captioning is relatively commonplace, however the implementation is highly inconsistent and usually patchy and poorly executed.

Motor – New input devices, control schemes, and mechanics has contributed to significant growth.

Cognitive – Although many therapeutic titles exist for profound cognitive impairment, commercial considerations are rare.

Vocal & Communication – Speech is now beginning to be included as an input method as well as simply communicating with other players on select titles.

Can we be all things to all people...

No, but it's a nice goal to strive for.

So Why We Should Care?

- User Satisfaction
- Reach Greater Audience
- Address Government Regulations
- Provide New Skill Building Opportunities

Practically Speaking...

- Project Requirements
- Budget and Resource Considerations
- Platform Limitations
- Demographic Considerations
- Etc.

Know Your Audience

You will need to make compromises...

- What are their interests?
- What limitations could they have?
- What will make your audience happy?
- What are your anchors?

Possible Limitations of Player

1. Manual Dexterity

- Includes full control of one or more hands to severely limited movement of fingers or the need for peripheral devices such as mouthsticks.
- Poor articulation of the fingers often leads to knuckles dragging or fingers accidentally resting on the device which creates multiple unintentional “taps”

2. Varying Touch Speed & Accuracy

- Motor impairment often leads to lack of control over pressure sensitivity, speed, and accuracy due to muscle weakness and involuntary movements.

Possible Limitations of Player

3. Limited Range of Motion

- Due to muscle atrophy or direct neuropathy an individual's range of movements may be limited requiring devices to be placed in strategic spots (e.g. resting on thigh) or mounts. For those affected this often prevents access to the full screen.

4. Spasms and Involuntary Movements

- For those affected, involuntary movements big and small can lead to accidental taps, interrupted swipes, and lack of accuracy.

Design Guidelines

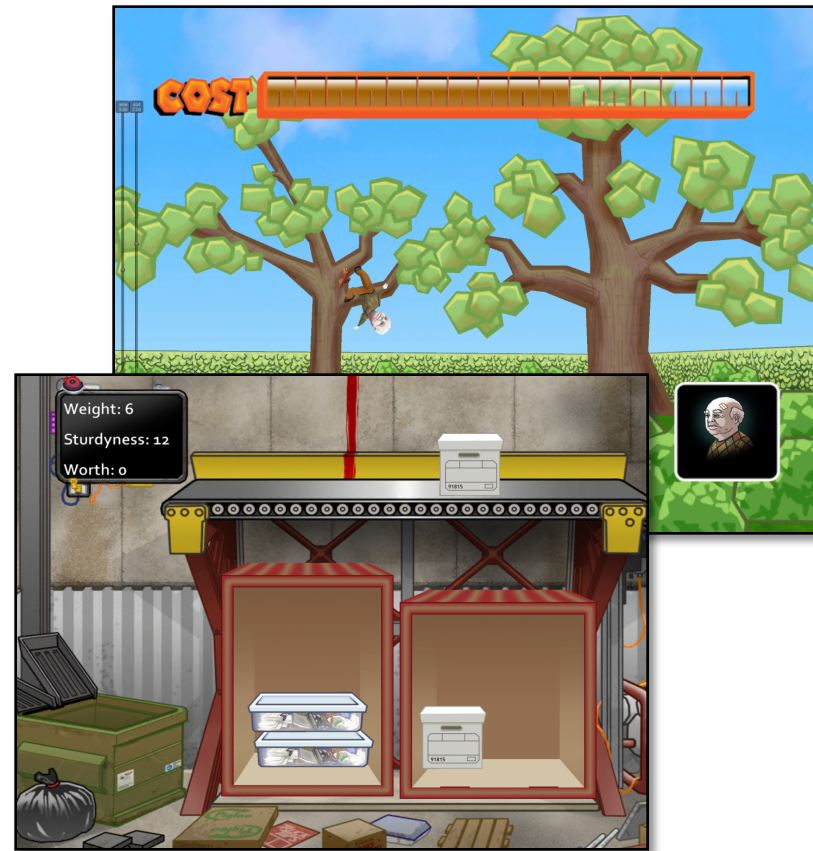
Single vs. Double Tap

- Accuracy limitations/Spasms may make it difficult to touch screen in same location twice.
- Muscle weakness can make it difficult to tap twice with the speed or force required.
- Rely on single taps, swipes, and context sensitive menus.
- Requires additional development and design considerations to juggle the many interactions players have come to expect.



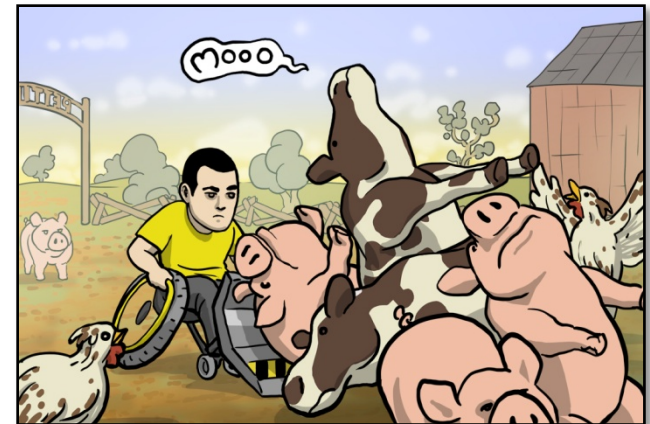
Cerebral Challenges vs. Reflex

- Response time, accuracy and player abilities can vary. (The game is too hard or too easy)
- Focusing on cerebral/thinking challenges can lower frustration and shift emphasis away from twitch reflex
- Risk of being too easy, difficult to fit certain genres, doesn't satisfy "twitch junkies"
- Difficult for users with mental limitations



Single Action Mechanics

- Some can't use both hands
- Difficult to juggle multiple actions
- Dual joysticks present problems
- Requires extra care with design
- Often needs special code (ex. Auto-Aim)



Quick Swipes vs. Long Gestures



- Those with limited motor function often struggle with long precise gestures due to spasms, placement of the device on their thigh or in a mount, and general range of motion limitations.
- Quick swipes are easier for individuals to execute and thus leads to greater enjoyment.



Navigation Schemes

Tap-n-Go

Tap where you want to go in the environment and the character moves there automatically

Pros

- Very accessible
- Passes all the guidelines

Cons

- Can be dull
- Less control over player
- Can't control speed



Drag the Player

Player drags his finger along the screen. The character follows the gesture.

Pros

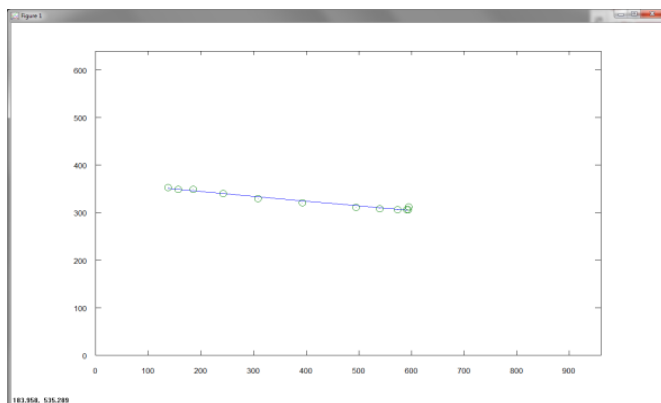
- Allows for fine control of the character.
- Easy to implement and cheap



Drag the Player

Cons

- Requires long gestures and constant interactions.
- More reflex than cerebral
- Player must path around obstacles
- Device gets noisy input



Independent Drive

Scrollbars on either side of the screen control the player's "wheels" independently

Pros

- Mimics real-world wheelchair dynamics
- Can do fancy maneuvers
- Small modification can work for mouth sticks

Cons

- "Fun" controls not accessible for all users.



Trackball

Virtual trackball over screen.
Swipe in direction player should go. Speed and length of swipe affects speed of player.

Pros

- Mimics real-world wheelchair dynamics
- Can do fancy maneuvers
- Works for mouth sticks

Cons

- Continuous swipes can lead to fatigue
- Some users intuitively use ineffective rapid swipes



Thanks!

